Heisenberg's energy-time uncertainty principle, time dilation, time contraction are effects due to energy shifts not to *non-observable* time shifts.

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See my papers about time and many other interesting subjects at:

https://archive.org/details/@nonessentialtime_gmail_com?sort=-week

07/22/21

Abstract

Heisenberg's energy-time uncertainty principle states:

$$\Delta E \, \Delta T \geq \hbar/2$$

There is a minimum for the product of the uncertainties of the energy, ΔE, and time, ΔT. This is not a statement about the inaccuracy of measurement instruments, nor a reflection on the quality of experimental methods; it arises from the wave properties inherent in the quantum mechanical description of nature. Even with perfect instruments and technique, the uncertainty is inherent in the nature of things. **Note that 'time' is not an observable in quantum mechanics and classical mechanics as well!**

Although this has been verified by experiments, their interpretation concerning the nature of time depends on the process of measurement and operational definitions of these quantities as functions of the steps involved in comparing signals from observed events with standard or atomic clocks to give number values to the states associated with the configurations of the system under observation.

The key question here is what is assumed to be the fundamental nature of time for quantum systems in which this relation applies.

Examination of how time dilation and contraction effects are the result of ENERGY shifts in moving or observed systems with respect to standard [e.g. atomic clocks] or subjective [e.g. our brains T-computer] clocks that measure these effects. It is shown that these effects are really due to changes at the quantum excitation and decay modes of unstable or evolving systems manifested by reconfigurations resulting in the modification of the 'lifetimes' of excited states caused by altered energy levels in these quantum or classical systems.

This is due to the increased or decreased net energy of the systems under observation. Time modification is examined in the context of the energy-time uncertainty principle and its ad hoc derivation in quantum mechanics.

The result is that time dilation and contraction effects are really due to energy shifts in the source of signals [e.g. photons, particles, classical electromagnetic wave etc.] and time itself is a derived concept and not fundamental as it is generally assumed in derivations of Heisenberg's energy-time uncertainty relation.

First we look at a review of the 7 principles found to be the actual nature of time.

1. Philosophy of Time: time exists as information, NOT as a dimension. Time is as real as information is real.

2. Arrows of Time: Quantum Arrows of Time [QATs] and all other arrows of time only exist as constructions from signal/information flow in causal networks. All arrows of time point from cause [source] to effect [sink] from simple 2-level systems at the quantum scale such as photon emission in atoms up through the cosmological domain through hierarchical scaling of interconnected causal networks at various plateaus of complexity [POCs].

3. Direction of Time: only exists as directions associated with vectors representing arrows of time pointing from cause to effect [source to sink] in the causal networks of the evolving universe.

4. There is no Time to travel 'in', only space [i.e. the vacuum] where the 'now' created by our consciousness is all we can directly experience. Note that the vacuum exists as a physical entity and space is only a map of this fundamental basis for the universe. **"The Map is not the territory" - Alfred Korzybski**

5. Our brains T-computer [see figure below] creates 'time' labeled maps of the patterns of observed changes in the configurations of matter in the universe into sequential time stamped and labeled memories. **Change is a Fundamental property of the universe, time is not.**

> **"No change then means no time"- J. B. Priestley from 'Man and Time' 1964, page 64.**

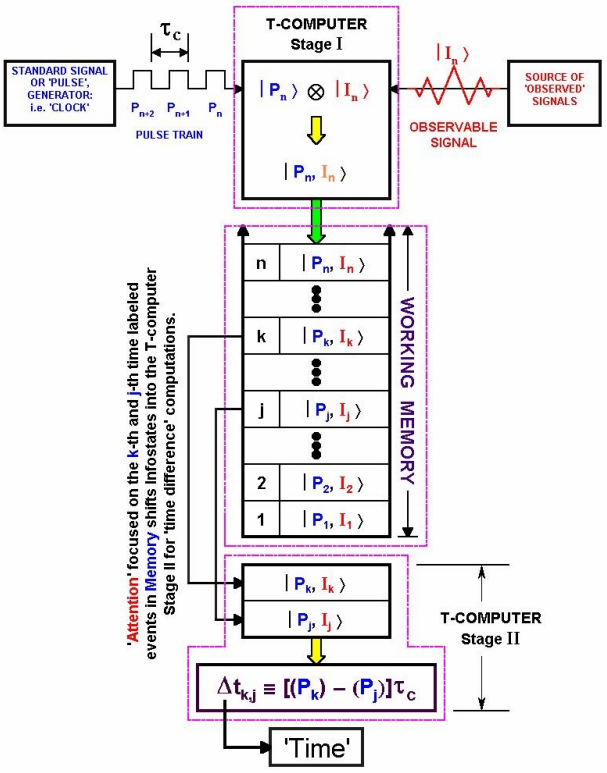


Figure 1. The T-computer of the brains logic [confirmed by fMRI evidence] is illustrated above.

6. The Problem of Time therefore has been solved by this author using Feynman Clocks, **T-computers**, and Causal Networks. See the following:

T-computers and the Origins of Time in the Brain September 2007

7. The Vacuum is space and Time is a measure of Changes in the configuratons of matter floating on the surface of the vacuum. We attribute dimensions to the vacuum [space] as part of our application of geometry [models] to the real world. The vacuum is much more complex that mere 'empty' space. The vacuum is in fact a multi-vacuum with properties that depend locally on matter and globally on cosmic universality. Cosmological evolution is measured by the maps of change we construct using time as a metric.

Note: the speed of light is a fundamental property of the multi-vacuum 'surface' of the deep energy sea that contains the missing mass and dark energy of the universe. This is why it can't be violated by mythical particles such as tachyons or space-time fabrications and fantasies such as cosmic tunnels or wormholes.

Time dilation and contraction [typically in special relativity] are not directly observable since time is not an observable. Energy reconfigurations are observable such as the detection of photons from electron orbital changes in an atom. It is the energy of the system that changes due to motion relative to a detector on internal reconfiguration processes that are time-independent but occur in finite lifetimes of unstable states. The lifetimes are unstable states are intrinsic to the energy of the system and its probability or decay mode transitions -SMH.

See the following for a discussion of why space-time diagrams are wrong especially when looking at time as a fundamental property of the universe:

Article: The Theory of Positrons* BY R. P. FEYNMAN [1949] IT IS PROVED THAT HIS PROPOSAL THAT POSITRONS CAN BE TIME REVERSED ELECTRONS IS WRONG

Special Note: Time is still useful as a measure of change in our daily lives. Using repeating reproducible regular signal generating systems such as standard clocks [e.g. atomic clocks, watches, computer clocks etc.] gives us a way to create our ordered time maps.

Time produced by comparison of a standard clock with the observed system and processed by our brains T-computer or similar 'clocked' information processing devices is 'real'. The reality of time as a pacer of human activities is embedded in our lives.

Now we look at the problems with the use of time in the uncertainty relation as it is conventionally used

From the following paper **The Time-Energy Uncertainty Relation by Paul Busch** we have the following ideas about time in quantum mechanics.

> "The time energy uncertainty relation has been a controversial issue since the advent of quantum theory, with respect to appropriate formalization, validity and possible meanings.
>
> The purpose of this chapter is to show that **different types of time energy uncertainty relation** can indeed be deduced in specific contexts, but that there is no unique universal relation that could stand on equal footing with the position-momentum uncertainty relation.
>
> To this end, we will survey the various formulations of a time energy uncertainty relation, with a brief assessment of their validity, and along the way we will indicate some new developments that emerged since the 1990s."

"The conundrum of the time energy uncertainty relation is related to an ambiguity concerning the role of time in quantum theory. In the first place, time is identified as the parameter entering the Schrodinger equation and measured by an external, detached laboratory clock.

This aspect will be referred to as pragmatic, or laboratory, or **external time**.

By contrast, time as dynamical, or **intrinsic time** is defined through the dynamical behavior of the quantum objects themselves.

Finally, time can also be considered as an observable – called here **observable time**, or **event time.** These three aspects of time in quantum theory will be explained in some more detail."

Most physics sources concerning derivations of quantum mechanics fundamentals say that time is not an 'observable' and rightly so since it is a construction...what you can observe are signals generated in the decay and energy shift reconfiguration processes of unstable systems thesis are then used to construct a time associated with the information detected from the event. Therefore observable time, event time, intrinsic time, and external time are also constructions as are any number of other 'times' and have no fundamental properties like the space of the vacuum and the observable matter that composes our universe-SMH.

Note: I will comment on the hidden or implicit assumptions and fundamental errors in each of these statements at the end of each. In all of these there are assumptions about how time is measured and comparisons to standard clocks.

If you want to measure energy, you should somehow follow the wave-function evolution in time. To measure energy definitely, you should measure it during infinite time. If the time of measurement is limited, the energy is not definite.

Where ΔT is the uncertainty in time measurement of an object. What does the ΔT mean, since t is not even an observable? We will discuss the answer to this below.

The uncertainty principle for energy and time is not a canonical uncertainty relation because it is not based/produced by canonical Hamiltonian variables, instead it expresses dispersion and lifetime of a state. There is a confusion of a Cartesian space-time x, t (used as parameters) and canonical position and momenta (q,p) which are functions of these parameters (however simple in some cases, like q=x)

The assumptions about spacetime are where the time paradoxes originate.

In fact, there are various approaches and interpretations of time-energy uncertainty. For example:

1. **Energy-dispersion** (ΔE) of a state and **lifetime** (Δt or τ_s) of the state itself.
2. **Energy exchange** (ΔE) and **time-frame** (Δt) during which this can happen.
3. **Energy measurement** (ΔE) and **time** (Δt) it needs for accuracy.

ΔE has the meaning of uncertainty in the observed energy of a changing or evolving system. We have:

$$\Delta E\, \Delta T \geq \hbar/2$$

If we solve for ΔT we have:

$$\Delta T \geq \hbar/[2\Delta E]$$

We can see that as ΔE goes to infinity, ΔT goes to 0. This means that if big changes in the observed system's energy of configuration occur, then ΔT approaches 0 uncertainty in the time measurement associated with the energy state changed regardless of the three interpretations listed above. This also means that as ΔE goes to 0, ΔT goes to infinity. This can be interpreted as "no change then means no time"!

"We summarize [from Busch] the main types of time energy uncertainty relations and their range of validity depending on the interpretation of the quantities ΔT and ΔE":

(1) A relation involving **external time** is valid if ΔT is the duration of a perturbation or preparation process and ΔE is the uncertainty of the energy in the system.

This assumes an external clock and there for an external tiem to mark the measured energy state changes of the observed system and that time has a fundamental nature like the space of the vacuum. is measured and comparisons to standard clocks. The fallacy here is that exists some sort of external time in addition to the other 'times'. There is no fundamental 'external time' -SMH.

(2) There is no limitation to the **duration** of an energy measurement and the disturbance or inaccuracy of the measured energy.

Time is not measured but constructed from information generated by energy changes in the configuration of the observed system and the 'duration' of these processes is misnamed since time is not an observable but a construction and duration is a computed artifact of the observable 'timeless' energy changes between two events such as the start and end of an observed process -SMH.

(3) There is a variety of measures of characteristic, **intrinsic times**, with ensuing universally valid dynamical time energy uncertainty relations, ΔE being a measure of the width of the energy distribution or its fine structure.

There is not intrinsic time. Time is not measured but constructed from information generated by energy changes in the configuration of the observed system and 'intrinsic times' are misnamed since time is not an observable and any assignment of intrinsic time to a system is as fallacious and artificial as saying it is driven 'in time' to change into another state in which time is a 'dimension' like 'space' in the false geometric models of space time that allow for time travel, time reversal and multiple [one or more] time dimensions. -SMH.

(4) **Event time observables** can be formally represented in terms of positive operator valued measures over the relevant time domain. An **observable time energy uncertainty relation**, with a constant positive lower bound for the product of inaccuracies, is not universally valid but will hold in specific cases, depending on the structure of the Hamiltonian and the time domain.

Time is not measured but constructed from information generated by energy changes in the configuration of the observed system and 'event time observables' are misnamed since time is not an observable. Event times are time labeled detected events using the T-computer of the brain or a similar device to attach a number [memory location] to an information byte or word. Events thus marked with a time label can be organized and compared with other time labeled event to compute elapsed times or time differences between sequential events [stored in some sort of memory] with respect to a biological [e.g. the T-computer, intrinsic to the brain] or a standard clock [e.g. atomic clock, extrinsic to the brain]. Information generated [e.g. photons] by unstable systems that undergo entropy driven changes and therefore energy reconfigurations is used to construct event times and all other times associated with observed events. An 'observable time energy uncertainty relation' is a construction and not fundamental -SMH.

(5) **Time measurements** by means of quantum clocks are subject to a dynamical time energy uncertainty relation, where the **time resolution** of the clock is bounded by the unsharpness of its energy.

Time is not measured but constructed from information generated by energy changes in the configuration of the observed system. For example we have photon emission from electron transitions from an excited stae to a lower energy state in an atom. The photon carries the transition information in the form of its energy by the equation:

$$E = \hbar\nu$$

where ν is the *time independent* observable frequency of the photon. -SMH

(6) Einstein's photon box experiment constitutes a demonstration of the **complementarity of time of passage** and energy: as a consequence of the **quantum clock** uncertainty relation, the inaccuracy ΔE in the determination of the energy of the escaping photon limits the uncertainty ΔT of the opening time of the shutter. This is in accordance with the energy measurement uncertainty relation based on **internal clocks** discovered recently by Aharonov and Reznik. **Time is not measured but constructed from information generated by energy changes in the configuration of the observed system and 'internal clocks' are merely unstable systems that undergo entropy driven changes and therefore energy reconfigurations. These systems may be called clocks but the fact remains that they are not operating in some fictitious realm called the 'time' dimension asumed to have the property of 'time passage' -SMH.**

(7) **Temporal diffraction** experiments provide evidence for the objective indeterminacy of event time uncertainties such as time of passage. **This is an erroneous concept because it assumes physical properties for time allowing for 'diffraction' which is in fact not possible. Time is not an object, it is a construction using information, standard clocks and a T-computer. This could be our brains T-computer or a device made by us modelec after it. -SMH.**

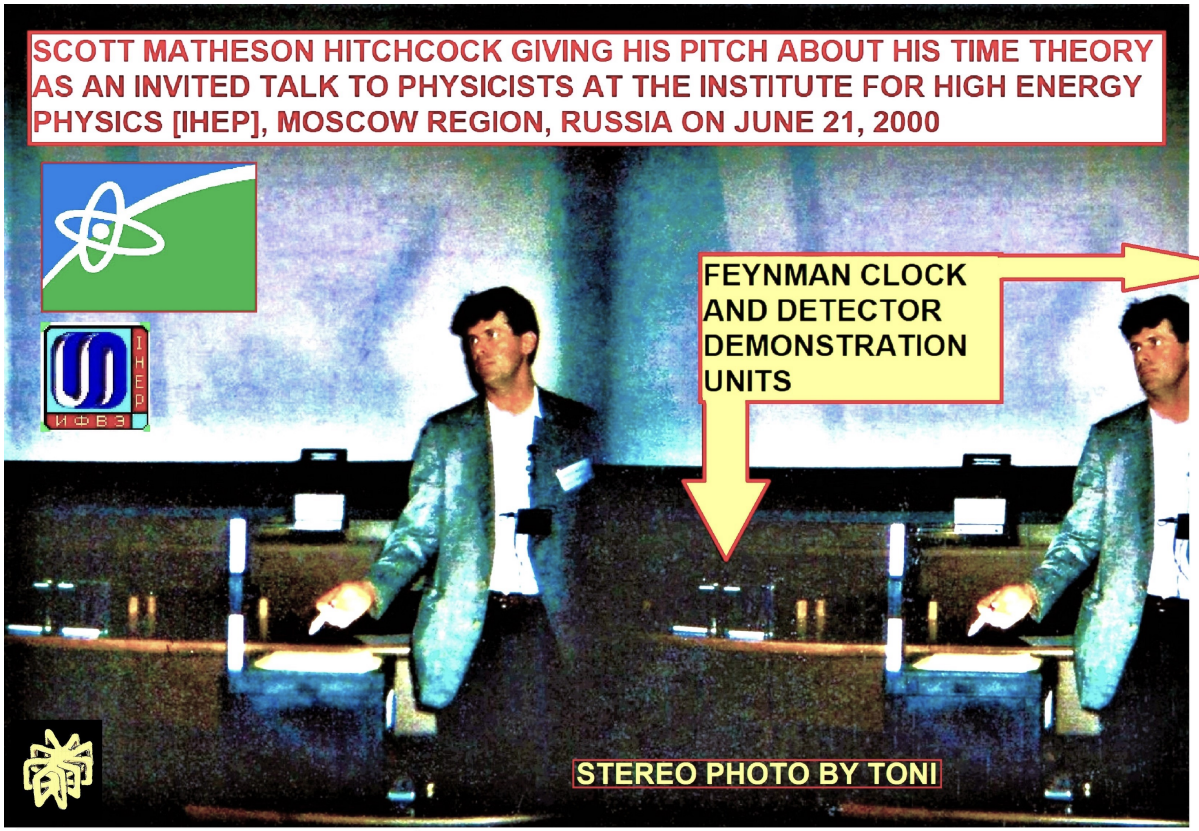
(8) A full-fledged **quantum mechanical theory of time measurements** is still waiting to be developed. **The error here is that time measurements depend on processes of mapping signals from evolving systems with signals from a standard clock onto a memory state with an assigned a numerical 'time' or time difference as a label for the observed and recorded states of the evolving system such as the before [initial] and the after [final] configurations. There is no need for a quantum mechanical theory of time since time is a construction and not fundamental to quantum mechanical processes involving reconfigurations of the unstable systems and their energy states.-SMH.**

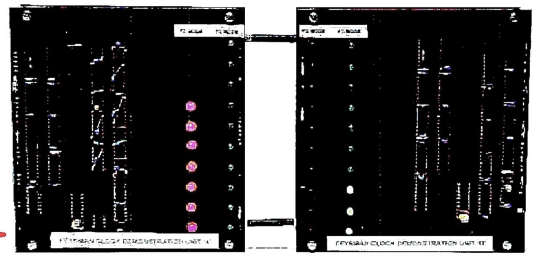
Is this energy-time uncertainty relation useful?

Yes, if you have the correct theory of time as information originating in changing or evolving systems and compared to a standard clock using the T-computer in our brain. The various types of time listed above are all constructions from observed energy changes in a given system and are not fundamental like matter and the vacuum.

Space-time constructions are misleading and should be replaced by causal networks from which time can be derived.

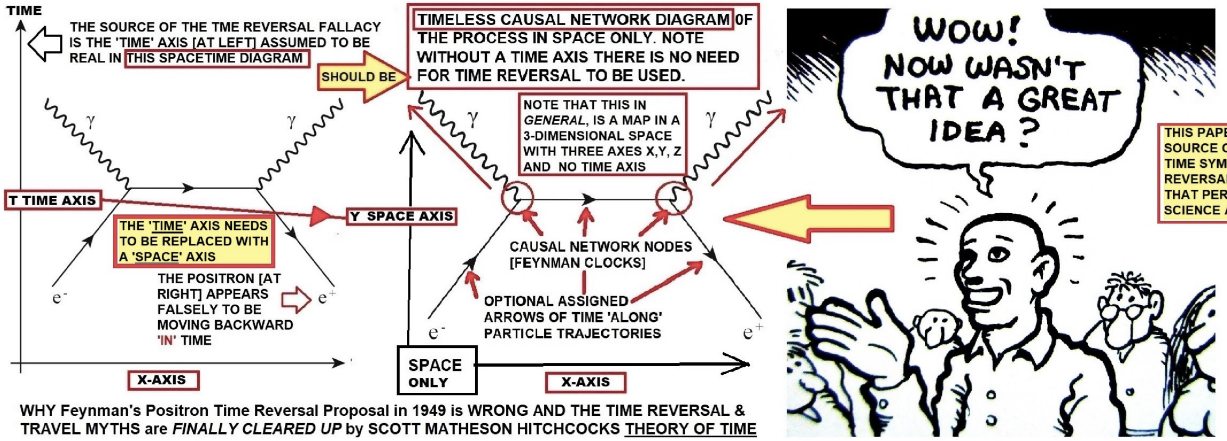
SCOTT MATHESON HITCHCOCK GIVING HIS PITCH ABOUT HIS TIME THEORY AS AN INVITED TALK TO PHYSICISTS AT THE INSTITUTE FOR HIGH ENERGY PHYSICS [IHEP], MOSCOW REGION, RUSSIA ON JUNE 21, 2000





IHEP 2000 [Russia] An Invited Talk "Feynman Clocks And The Origins Of Time In Complex Systems From The Big Bang To The Brain" by Scott Matheson Hitchcock Given at The Institute For High Energy Physics [IHEP] , Protvino, Russia. Presented: Wednesday, June 21, 2000

Feynman Clock Demonstration Units, The units illustrate the status of the excited (green LEDS) and detector states (red LEDs) of two representative FC-nodes or gates in a causal network. Each of the two identical FC/FD units in the kit is a battery operated infra-red photon pulse transmitter and detector. Signals from one unit are sent to the other unit by conventional infrared sources and detectors used in television remote controls. They are shielded from stray light by the two hollow black tubes between the units. The 'time' interval between successive FC signal emissions (accompanied by a decreasing number of green LEDS displayed on the transmitter) represents the lifetime of the collective exctiation state forthat system configuration given by the number of LEDs illuminated. The 'decay', or 'decoherence' lifetimes for the transition from the FD mode to the FC mode of a unit represent the internal reconfiguration process of the entire gate or node. The number of green LEDs displayed indicates hoe many signals or excited states remain in the Feynman Clock mode of that unit from a maximum possible number of 10. After all ten signals have been sent the transmitting unit shifts to a FD mode with no lights on. It remains in this mode until 10 signals have been detected by it or it is shut off. Examples of these systems include the photon emission and absorption in atoms, phonons or sound waves emitted or detected in crystals, and electron and 'exciton' flow in photosynthetic networks in plant cells. The cyclical circuits created with the feedback and feedforward of signals between these two units illustrates elementary information processing in neurons. Conventional 'time' between red/green LED events is created by the observer of the two node network by a process of signal mapping. The red and green light is mapped to the internal or standard clock of the observer from which the understanding of the causal nature of the information flow between these two units is related to the standard 'direction' and 'dimension' associated with 'time'.



WHY Feynman's Positron Time Reversal Proposal in 1949 is WRONG AND THE TIME REVERSAL & TRAVEL MYTHS are *FINALLY CLEARED UP* by SCOTT MATHESON HITCHCOCKS THEORY OF TIME

Time Reversal and The Theory of Positrons

By Scott Matheson Hitchcock

THE ORIGINAL PAPER* [Phys. Rev. 76, 749 – Published 15 September 1949] BY RICHARD P. FEYNMAN IS SHOWN TO BE INCORRECT WHERE TIME AND ITS DIRECTION ARE CONCERNED. See the figure below from Feynmans paper. IN the CAPTION for this FIGURE,THE LAST LINE STATES THE CONCLUSION THAT "electrons traveling backwards in time are recognized as positrons". This is an INCORRECT artifact due to the a-priori ASSUMPTION that time is a dimension and a component of space-time and more importantly that time is reversible.

Time symmetry does not exist.

THIS PAPER IS THE PRIMARY SOURCE OF THE *MYTHS* OF TIME SYMMETRY, TIME REVERSAL AND TIME TRAVEL THAT PERSIST IN THE SCIENCE AND SCI-FI WORLDS

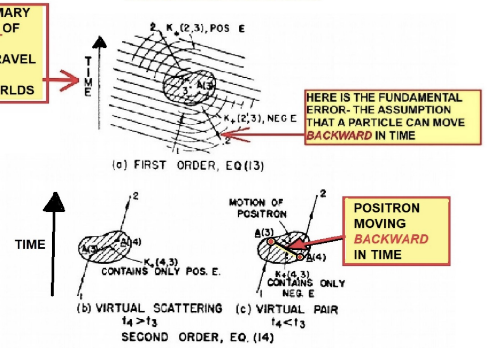


FIG. 2. The Dirac equation permits another solution $K_+(2, 1)$ if one considers that waves scattered by the potential can proceed backwards in time as in Fig. 2 (a). This is interpreted in the second order processes (b), (c), by noting that there is now the possibility (c) of virtual pair production at 4, the positron going to 3 to be annihilated. This can be pictured as similar to ordinary scattering (b) except that the electron is scattered backwards in time from 3 to 4. The waves scattered from 3 to 2′ in (a) represent the possibility of a positron arriving at 3 from 2′ and annihilating the electron from 1. This view is proved equivalent to hole theory: electrons traveling backwards in time are recognized as positrons.

SCOTTS NEW THEORY OF TIME: WHERE TIME IS COMPUTED FROM INFORMATION EXTRACTED AND PROCESSED FROM SIGNALS BY A *SYSTEM* COMPOSED OF CAUSAL NETWORKS, FEYNMAN CLOCKS [AS NODES IN THE CAUSAL NETWORKS], STANDARD CLOCKS [FOR CALIBRATION], AND THE BRAINS T-COMPUTER.

►►►►► A SYSTEMS APPROACH GIVES US THE ***SOLUTION*** TO THE PROBLEM OF TIME:

FOR SIMPLE SYSTEMS, ACCORDING TO THE PRINCIPLE OF OCCAM'S RAZOR THE SIMPLEST EXPLANATION FOR OBSERVED BEHAVIORS IS THE BEST CHOICE. BUT FOR COMPLEX SYSTEMS, A *SYSTEMS APPROACH* IS NECESSARY FOR UNDERSTANDING THE OBSERVED PHENOMENA. CLEARLY SIMPLE EXPLANATIONS ABOUT THE FUNDAMENTAL NATURE OF TIME ARE NOT ADEQUATE, THIS IS WHY SCOTT REALIZED THAT TO UNDERSTAND THE NATURE OF TIME HIS SYSTEMS APPROACH WORKS TO CLARIFY ISSUES ABOUT THE FUNDAMENTAL PHYSICS AND NATURE OF TIME.